COURSE SYLLABUS

LAST REVIEW	Fall 2021
COURSE TITLE	Calculus and Analytic Geometry III
COURSE NUMBER	MATH0224
DIVISION	Math, Science, Business & Technology
DEPARTMENT	Mathematics
CIP CODE	24.0101
CREDIT HOURS	5
CONTACT HOURS/WEEK	Class: 5
PREREQUISITES	MATH0123 Calculus and Analytic Geometry II having earned a "C" or better. May be taken concurrently with MATH0227 Differential Equations.
COURSE PLACEMENT	None

COURSE DESCRIPTION
Calculus & Analytic Geometry III is designed for students in mathematics, hard sciences, and engineering. Content includes analytic and solid geometry, vectors, multivariable calculus, multiple integrals, and applications of these topics. Students will be expected to use appropriate technology as one tool to achieve competency in Calculus and Analytic Geometry III. A graphing calculator is required for this course.

GENERAL EDUCATION LEARNING OUTCOME
☐ Basic Skills for Communication
☒ Mathematics
☐ Humanities
☐ Natural and Physical Sciences
☐ Social and Behavioral Sciences

INSTITUTIONAL LEARNING OUTCOMES
☐ Communication
☒ Computation and Financial Literacy
☒ Critical Reasoning
☒ Technology and Information Literacy
☐ Community and Civic Responsibility
☐ Personal and Interpersonal Skills

TEXTBOOKS
http://kckccbookstore.com/

METHODS OF INSTRUCTION
A variety of instructional methods may be used depending on content area. These include but are not limited to: lecture, multimedia, cooperative/collaborative learning, labs and demonstrations, projects and presentations, speeches, debates, panels, conferencing, performances, and learning experiences outside the classroom. Methodology will be selected to best meet student needs.

COURSE OUTLINE

I. Vectors
   A. Vectors in the plane
   B. Vectors in space
   C. Dot product of two vectors
   D. Cross product of two vectors
   E. Lines and planes in space
   F. Surfaces in space
   G. Cylindrical and spherical coordinates area

II. Vector-Valued Functions
   A. Domain
   B. Differentiation and integration
   C. Velocity and acceleration
   D. Tangent vectors and normal vectors
   E. Arc length and curvature

III. Functions of Several Variables
   A. Domain and range
   B. Limits and continuity
   C. Partial derivatives
   D. Differentials
   E. Chain Rule
   F. Directional derivatives and gradients
   G. Tangent planes and normal lines
   H. Extrema
   I. Applications
   J. Lagrange multipliers

IV. Multiple Integration
   A. Iterated integrals and area
   B. Double integrals and volume
   C. Change of variables: polar coordinates

D. Center of mass and moments of inertia
E. Surface area
F. Triple integrals
G. Triple integrals in cylindrical and spherical coordinates
H. Change of variables: Jacobians

V. Vector Analysis
A. Vector fields
B. Divergence and curl
C. Line integrals
D. Green's Theorem
E. Surface integrals
F. Divergence Theorem
G. Stokes' Theorem

COURSE LEARNING OUTCOMES AND COMPETENCIES

Upon successful completion of this course, the student will:

A. be able to manipulate vectors.
   1. to do computations with vectors in the plane.
   2. to do computations with vectors in space.
   3. to execute the dot product of two vectors.
   4. to execute the cross product of two vectors.
   5. to determine the equations of lines and planes in space.
   6. to recognize various surfaces in space from their equations.
   7. to convert rectangular coordinates to cylindrical and spherical coordinates

B. be able to differentiate and integrate vector-valued functions.
   8. to find the domain of vector-valued functions.
   9. to differentiate and integrate vector-valued functions.
   10. to find velocity and acceleration vectors.
   11. to determine unit tangent and normal vectors.
   12. to find arc length and determine curvature of a curve in space.

C. be able to execute calculus operations on functions of several variables and their applications.
   13. to describe the domain and range.
   14. to find the limits of functions of several variables in order to discuss their continuity.
   15. to find partial derivatives.
   16. to find differentials and use differentials to approximate quantities.
   17. to execute the chain rule.
   18. to find gradient vectors and directional derivatives.
   19. to find the equations of tangent planes and normal lines to a surface.
   20. to determine relative maxima, minima, or saddle points for functions of several variables.

21. to find extrema of functions of two variables in application problems.
22. to use Lagrange multipliers to find extrema.

D. be able to evaluate multiple integrals.
23. to evaluate iterated integrals to find area of regions.
24. to find volume of solids using double integrals.
25. to evaluate double integrals in polar coordinates.
26. to find the mass, center of mass, and moments of inertia using double integrals.
27. to use double integrals to find surface area.
28. to evaluate triple integrals to find volume.
29. to evaluate triple integrals in cylindrical and spherical coordinates.
30. to execute a change of variables for double integrals using Jacobian.

E. be able to utilize and evaluate vector fields, line integrals, and their applications.
31. to illustrate a given vector field.
32. to calculate the divergence and curl of a vector field.
33. to evaluate line integrals.
34. to use Green's Theorem.
35. to evaluate surface integrals.
36. to use the Divergence Theorem.
37. to use Stokes's Theorem.

ASSESSMENT OF COURSE LEARNING OUTCOMES AND COMPETENCIES

Student progress is evaluated through both formative and summative assessment methods. Specific details may be found in the instructor's course information document.

COLLEGE POLICIES AND PROCEDURES

Student Handbook
https://www.kckcc.edu/files/docs/student-resources/student-handbook-and-code-of-conduct.pdf

College Catalog
https://www.kckcc.edu/academics/catalog/index.html

College Policies and Statements
https://www.kckcc.edu/about/policies-statements/index.html

Accessibility and Accommodations
https://www.kckcc.edu/academics/resources/student-accessibility-support-services/index.html.